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PATENT SPECIFICATION

Application Date: April 2, 1932. No. 9536/32. 399,223

Complete Left: Feb. 1, 1933.

Complete Accepted: Oct. 2, 1933.

PROVISIONAL SPECIFICATION.

Apparatus for Actuating or Controlling Electrically Operated Machines.

We, HERBERT MORRIS LIMITED, a British Company, of Empress Works, Loughborough, Leicestershire, and GEORGE ARCHIBALD ROBERTSON, of British Nationality, of the same address, do hereby declare the nature of this invention to be as follows:—

This invention relates to apparatus for controlling or actuating electrically operated machines, such as cranes, winches or the like and has for an object an improved arrangement by which slow speeds as well as intermediate and fast speeds of movement may be positively obtained with either alternating or direct current motors and in which only a small starting current is required, so that squirrel cage motors may be employed.

In accordance with the invention there are employed two motors for driving the winch or the like, one of these motors being hereinafter referred to as the actuating motor and the other as the relieving motor.

These motors drive through co-axial shafts pinions of different sizes of a differential or like gearing transmitting motion to a pinion which transmits the resultant speed to the hoist drum or motion to be driven. The actuating motor drives the larger and the relieving motor the smaller pinion.

An automatic electro magnetic holding brake is mounted on the shaft driven by the relieving motor to retain the relieving motor at rest while an automatic electro magnetic brake pulley is connected with the pinion transmitting the resultant speed to the hoist drum or motion to be driven. The variable differential connection between the pinions of different sizes driven by the motor may be provided by a pair or pairs of pinions one driven by the smaller and the other by the larger pinion and both connected with the pinion transmitting the resultant speed.

To obtain the slow speed the motors are driven in opposite directions by means of a controller common to the two machines. To obtain an intermediate speed the circuit of the relieving motor is opened and the motor stopped and held stationary by its electro-magnetic brake through the medium of the controller, while to obtain the fast speed the controller is moved into a position which again closes the circuit of the relieving motor but causes it to rotate in the same direction as the actuating motor.

By introducing additional contacts in the controller variable speeds can be obtained from slow to a maximum, the speed resultant depending on whether the current is direct or alternating and whether squirrel cage or slip ring induction motors are used, and the number of resistance banks and controller contacts introduced.

Dated this 2nd day of April, 1932.

CRUIKSHANK & FAIRWEATHER,
65—66, Chancery Lane, London, W.C.2,
and
29, St. Vincent Place, Glasgow,
Agents for the Applicants.

COMPLETE SPECIFICATION.

Apparatus for Actuating or Controlling Electrically Operated Machines.

We, HERBERT MORRIS LIMITED, a British Company, of Empress Works, Loughborough, Leicestershire, and GEORGE ARCHIBALD ROBERTSON, of British Nationality, of the same address, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to apparatus for controlling or actuating electrically operated machines, such as cranes, winches or the like and has for an object an improved arrangement by which slow speeds as well as intermediate and fast

speeds of movement may be positively obtained with either alternating or direct electric current motors and in which only a small starting current is required, so that squirrel cage motors may be employed.

It is known to provide a variable speed electric drive by connecting electric motors together with a differential gear.

In accordance with the present invention there are employed two similar constant speed motors for driving the winch or the like, one of these motors being hereinafter referred to as the actuating motor and the other as the relieving motor.

These motors drive through co-axial shafts pinions of different sizes of a differential or like gearing transmitting motion to a pinion which transmits the resultant speed to the hoist drum or motion to be driven. The actuating motor drives the larger and the relieving motor the smaller pinion.

An automatic electro-magnetic holding brake is adapted to act on the shaft driven by the relieving motor to retain the relieving motor at rest while an automatic electro-magnetic brake is adapted to act on the pinion transmitting the resultant speed to the hoist drum or motion to be driven. The variable differential connection between the pinions of different sizes driven by the motor may be provided by a pair or pairs of intermeshing pinions one driven by the smaller and the other by the larger pinion and both connected with the pinion transmitting the resultant speed.

The invention is illustrated by way of example in the accompanying drawing in which Fig. 1 is an axial section of a unit constructed in accordance with the invention and incorporating A.C. squirrel cage motors and electro-magnetic brakes, while Fig. 2 is a sectional end view of the differential gear drawn to a larger scale.

Referring to the drawing, 1 denotes a two-part field casing enclosing an actuating motor including a rotor 2 and a relieving motor including a rotor 3 secured on co-axial shafts 4, 5, respectively. The hollow shaft 4 is journalled in ball bearings 6, 7, mounted, respectively, in a central partition 8 between the motors and in an end cover 9 fitted to one end of the casing 1. The shaft 5 is journalled in ball bearings 10, 11 mounted, respectively, in the central partition 8 and in an end cover 12 fitted to the other end of the casing 1. 13 denotes a sun pinion secured in one end of the shaft 4 and meshing with a planet pinion or pinions 14 journalled on ball bearings on a pin 15 carried by a planet cage structure solid with a shaft 16 journalled for rotation coaxial with the shafts 4, 5 in a ball bearing 17 mounted in a housing 18 attached to the end cover 9 and enclosing the sun-and-planet gear assembly. The planet cage structure includes a disc 19 unitary with the shaft 16 and a ring 20 axially spaced from the disc 19 and journalled for rotation coaxial with the shafts on a ball bearing 21 carried by the shaft 4. A pinion (not shown) secured at 22 to the outer end of the shaft 16 serves to transmit motion to the hoist drum or other machine to be driven. The shaft 5 extends axially and projects beyond the shaft 4 into the interior of the housing 18. A pinion 23 secured to the end of the shaft 5 within the housing 18 meshes with a pinion or pinions 24 journalled on ball bearings on a pin 25 carried also by the planet cage structure 19, 20. As indicated in Fig. 2 pinions 14 and 24 intermesh.

The sun pinions 13 and 23 which have a different number of teeth mesh respectively with the intermeshing planetary pinions 14, 24, the whole constituting a differential epicyclic gear train which transmits the resultant motion to the hoist drum or other motion to be driven.

The end of the shaft 5 within the housing 18 is centred in a ball bearing 26 carried by the disc 19.

The brake pulley 27 of a main automatic electro-magnetic brake is secured on the shaft 16 while the brake pulley 28 of an automatic electro-magnetic brake is secured on an external extension of the shaft 5.

To obtain slow speed the rotors 2 and 3 are set in rotation in opposite directions under the action of a controller (not shown) common to the two motors and a slow speed will be obtained through the differential gearing due to the difference in the number of teeth on the pinions 13, 23. Thus the differential motion of the differential gearing 13, 14, 23, 24, will be transmitted to the driven shaft 16 and the pinion secured at 22. To obtain an intermediate speed the circuit of the relieving motor is opened whereupon said relieving motor is automatically braked and the pinion 23 held against rotation. The speed transmitted is dependent on the speed of the actuating motor. To obtain a fast speed the controller is moved into a position which again closes the circuit of the relieving motor but causes it to rotate in the same direction as the actuating motor as a result of which the sum of the motions of the differential gearing is transmitted.

By introducing in the controller one or more resistance banks and additional contacts further intermediate speeds may be obtained.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. Apparatus for controlling or actuating electrically operated machines such as cranes, winches or the like, including two similar constant speed motors driving through coaxial shafts pinions of different sizes of a differential or like gearing transmitting the resultant motion to a hoist drum or other machine to be driven and a controller by which the motors may be set in rotation in opposite directions to provide a slow speed.

2. Apparatus for controlling or actuating electrically operated machines such as cranes, winches or the like, as claimed in claim 1, wherein the controller is arranged to brake the one motor to provide an intermediate speed of the motion to be driven and on further movement to set both motors rotating in the same direction whereby to obtain a maximum speed.

3. Apparatus for controlling or actuating electrically operated machines such as cranes, winches or the like, constructed and arranged substantially as described with reference to the annexed drawings.

Dated this 1st day of February, 1933.

CRUIKSHANK & FAIRWEATHER,
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and
29, St. Vincent Place, Glasgow.
Agents for the Applicants.

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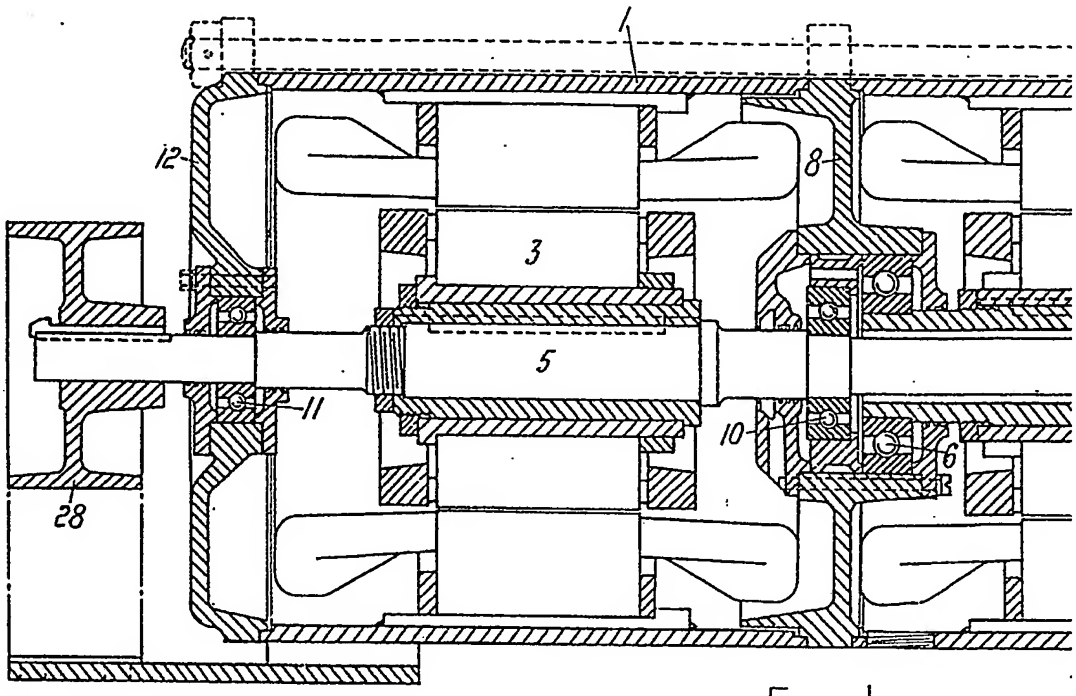
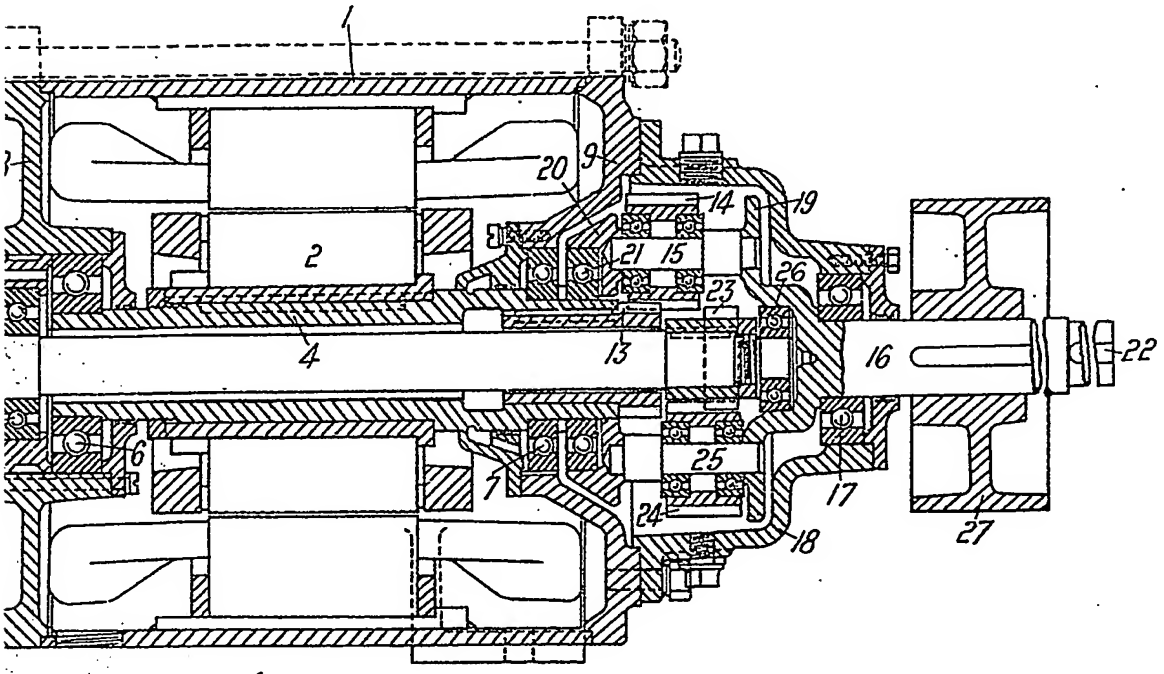


FIG. 1



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399,223 COMPLETE SPECIFICATION

2 SHEETS
SHEET 1

[This Drawing is a reproduction of the Original on a reduced scale.]

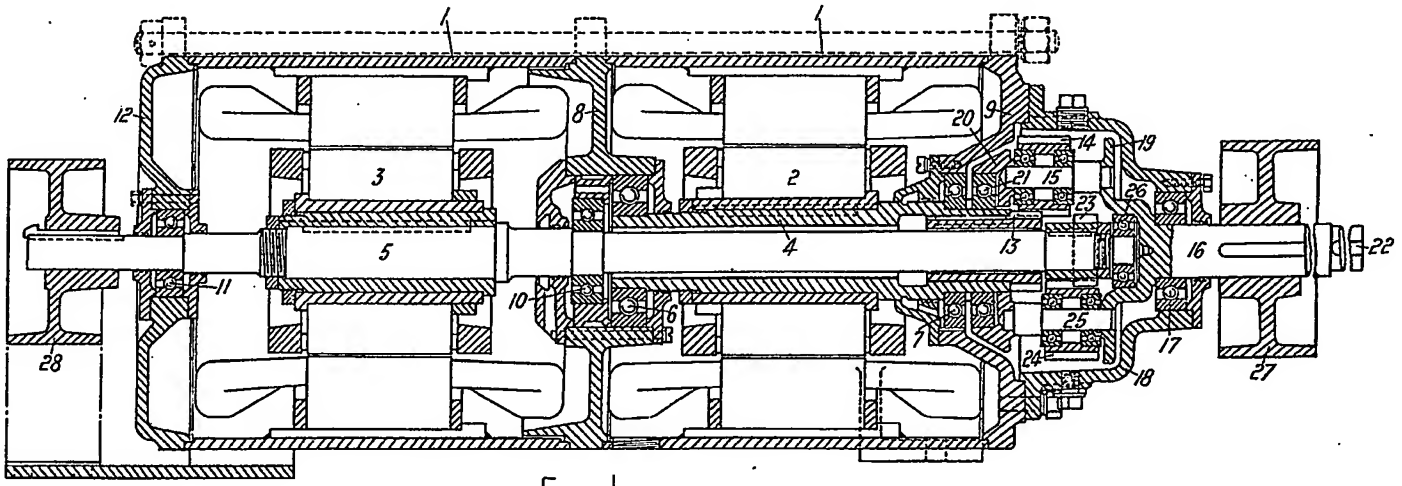

FIG. 1

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